FUTURE® DOMAIN

TMC-1650/1660/1670/1680 Installation Instructions

16-Bit High Performance
ISA SCSI Controller

TMC-1650/1660/1670/1680
Installation Instructions

16-Bit High Performance ISA SCSI Controller

Note

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Federal Communications Commission Radio Frequency Interference Statement (USA Only)

This equipment generates and uses radio frequency energy and may, if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, cause interference to radio and television reception.

It has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Shielded data cables were used during the type test; therefore, properly shielded and terminated data cables should be used to reduce potential interference. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions.

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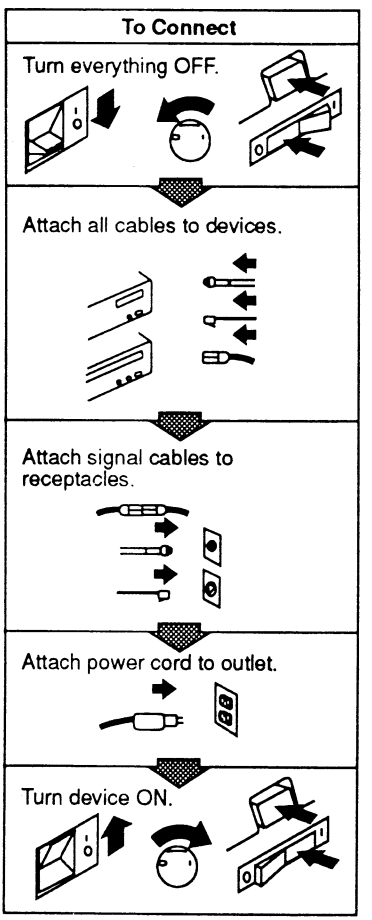
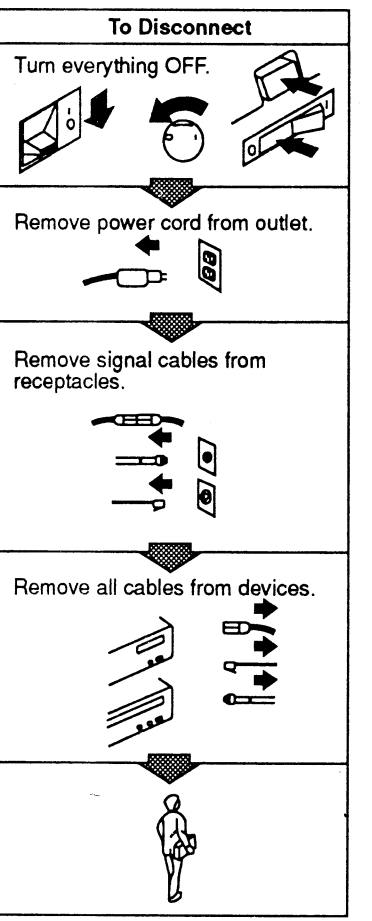
Electrical Safety

DANGER:

Electrical current from power, telephone, and communication cables is hazardous. To avoid shock hazard, connect and disconnect cables as shown below when installing, moving, or opening the covers of this product or attached devices. The power cord (also known as a power cable) must be used with a properly grounded outlet.



Note: In the U.K., by law, the telephone cable must be connected after the power cord.


To Disconnect
Turn everything OFF.
Remove power cord from outlet.
Remove signal cables from receptacles.
Remove all cables from devices.

Note: In the U.K., by law, the power cord must be disconnected after the telephone line cable.

Introduction

This manual provides step-by-step instructions for installing your TMC-1650, 1660, 1670, and 1680 SCSI ISA-bus controllers. These controllers are designed to offer easy PLUG & PLAY® installation for use with virtually any Small Computer Systems Interface (SCSI) CD-ROM drives, Photo-CD drives, Hard Disk drives, Scanners, Digital cameras, Magneto Optical drives, Rewritable drives, Tape drives, Digital Audio Tape (DAT), Printers, and other compatible SCSI devices that conform to SCSI-1 or the 16-bit wide SCSI-2 specifications.

Please take the time to familiarize yourself with the contents of this manual. Follow the installation instructions as they apply to your particular product installation. Then familiarize yourself with any of the software drivers to be used with the Future Domain SCSI controller(s) you will install.

Pre-installation Requirements

Requirements for using a Future Domain SCSI TMC-16XX controller are as follows:

- ✓ Future Domain TMC-16XX controller
- ✓ IBM PC/XT/AT, 386, 486 or compatible computer
- ✓ SCSI device(s) such as CD-ROM, Photo-CD drive, Hard Disk drive, Scanner, Digital camera, Magneto Optical drive, Rewritable drive, Tape drive, DAT, Printers, and other compatible SCSI device type
- ✓ Device driver or application program that supports the specific peripheral you are installing

The TMC-16XX controllers are supported in the following operating systems:

MS-DOS, PC-DOS*
Microsoft Windows NT
IBM OS/2 v2.0, v2.1
Microsoft OS/2 v1.3 LADDR, LAN Manager 2.1
SCO UNIX v3.2.4

* Disk support is built into the controller's ROM BIOS. FDC SCSIworks!, a universal application interface from Future Domain, provides additional support for CAM, ASPI, FastDisk, INT 13 extensions, and CD-ROM. Support for other devices may require

additional software drivers or applications.

SCO ODT v2.0
Novell Netware 386 v3.12, v4.0

TMC-16XX Features

The TMC-16XX controller is available in four different configurations to accommodate specific user environments. The configurations are described below.

- The **TMC-1650** and **TMC-1670** controllers are similar in that they both have the 25-pin external SCSI connector. The TMC-1670, however, has an on-board floppy controller and connector.
- The **TMC-1660** and **TMC-1680** controllers are similar in that they both have a SCSI-2 50-pin, high-density external connector. The TMC-1680, however, has an on-board floppy controller and connector.

The TMC-16XX controllers utilize a ROM BIOS that supports up to 7 SCSI bootable hard disk drives (with DOS v5.0 and above) without the need for additional software drivers.

The TMC-16XX controllers use Programmed Input/Output (PIO) technology as the method for data transfer. This method allows the host microprocessor to make extremely fast data transfers to and from memory via the system's I/O ports.

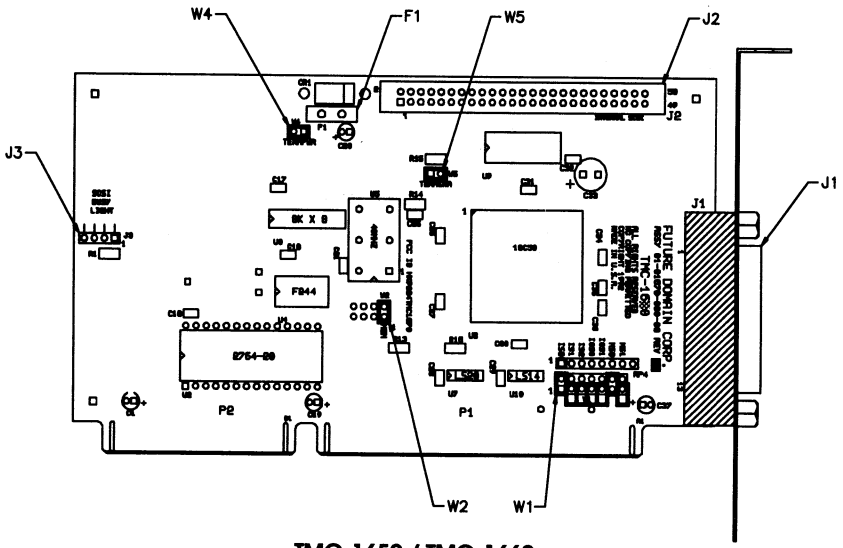
An advanced Future Domain SCSI controller chip is integral to all four controllers. The chip has an on-board 8K data buffer that eliminates processor overhead during data transfers.

The TMC-16XX controllers also use the high performance, SCSI-2, FAST-SCSI data transfer technology. This technology permits extremely fast data transfers—up to 10MB/second—to and from the SCSI bus, to support FAST-SCSI hard disk drives. Asynchronous, Synchronous, and Fast Synchronous data transfers are supported.

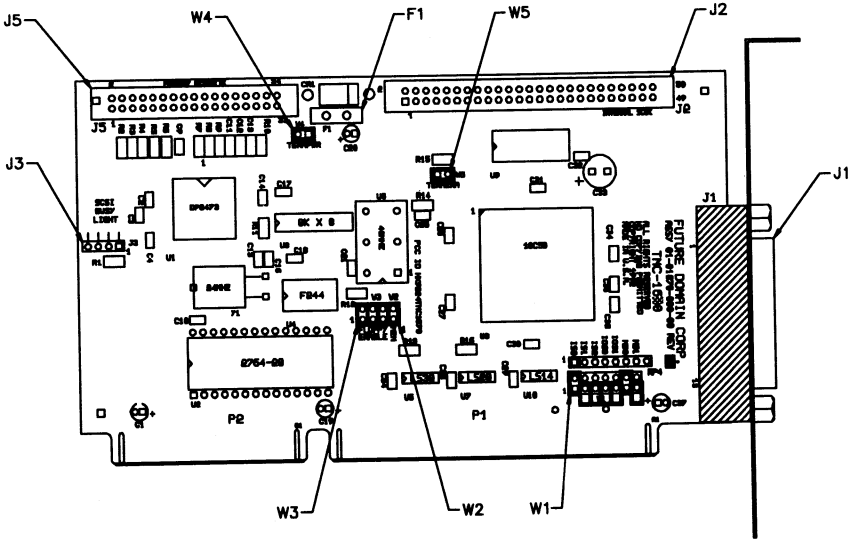
The advanced design of these controllers allows for PLUG & PLAY® connectivity and requires no user configuration in most installations. In the event that your specific environment requires a different configuration from the factory default, see details in "Appendix B: Setting Controller Options."

Configuration

The following two figures are representational drawings of the TMC-1650/1660/1670/1680 controllers, showing key features used for installation.



TMC-1650 / TMC-1660



TMC-1670 / TMC1680

Installation Overview

Note: Your computer and operating system should be installed before you install the controller and your SCSI devices

Install your controller and SCSI devices according to the following sequence:

- ✓ Determine the cables you will need (p. 7)
- ✓ Set the SCSI IDs of your SCSI devices (p. 9)
- ✓ Set termination (p. 13)
- ✓ Configure the controller (p. 15)
- ✓ Install the controller (p. 17)
- ✓ Install your SCSI devices (p. 21)
- ✓ Connect the cables (p. 23)

What You Need

You may need the following items to install the controller and internal SCSI devices:

- Installation instructions for your computer
- Installation instructions for SCSI devices you will install
- Flat-bladed screwdriver

You may need the following items to connect external SCSI devices to the controller:

- Installation instructions for SCSI devices you will install
- External cable for additional external SCSI devices

Handling the Controller

Warning: Do not take the controller out of its static-protective bag until you are ready to configure the controller or install it in your computer.

Static electricity can damage your equipment. Follow these precautions when handling the controller:

- Before you open the static-protective bag, touch it to a metal expansion-slot cover on the back of your computer. This reduces static electricity in the package and in your body.
- Do not touch any exposed printed circuitry.
- Keep other people from touching the controller. They might have a static-electricity buildup.
- Limit your movement, which can cause static-electricity buildup

If You Need Cables

You can purchase the following Future Domain Corporation cable assemblies from your dealer or distributor:

- HCA-102 — 2 internal connectors
- HCA-120 — 25-to-50-pin external (TMC-1650/70)
- HCA-112 — 50-to-50-pin external (TMC-1660/80)

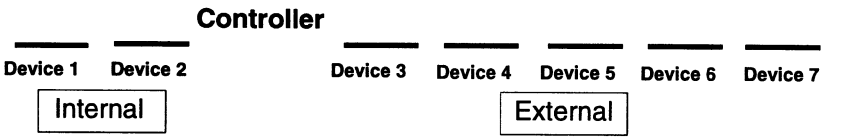
Step 1. Determining What Cables You Need

Your controller may come with a cable that you can use to connect one or two internal SCSI devices. The following shows how to plan your particular configuration. If you need to purchase an internal cable, you can order Future Domain's Model HCA-102 internal cable assembly from your dealer.

Planning Your Configuration

You can connect as many as seven SCSI devices to your controller in a "SCSI chain." Devices in the SCSI chain can be installed internally (inside the computer) or externally (outside the computer).

If you are connecting more than one external SCSI device, plan the layout of your SCSI chain.



Put your fastest or most used devices closest to the controller. For example, if you are using an external SCSI disk drive as your boot drive (the drive that contains your operating system), put it closest to the controller in the chain. Put slower devices, such as CD-ROM or optical drives, closer to the end of the chain.

Note: You can use a SCSI hard drive as your boot drive; however, if your computer contains a non-SCSI hard drive, the non-SCSI drive will be your boot drive.

Making Sure You Have the Right Cables

This is a concern only with external SCSI devices. External SCSI devices use a variety of connectors. Make sure you have cables with the appropriate connectors for each device in your planned SCSI chain.

Typical SCSI device connectors include: 50-pin Centronics-type connectors, high-density SCSI-2 connectors. If you need an external cable, you can order Future Domain's Model HCA-120 25-to-50-pin (TMC-1650/70), or Model HCA-112 50-to-50-pin (TMC-1660/80), cable assembly from your dealer.

Maximum Cable Length

SCSI specifications limit total cable length to 6 meters or about 19 feet. Short lengths of cable inside SCSI devices may reduce this maximum length.

Step 2. Setting SCSI IDs

Each SCSI device is identified by a SCSI ID number from 0 through 7. The basic rule of SCSI IDs is:

Each SCSI device must have a unique SCSI ID.

If two SCSI devices are set to the same SCSI ID, your computer will not run properly. SCSI ID #7 is reserved for the controller. You can use SCSI IDs 0 through 6 for your SCSI devices.

Your first step is to find out the SCSI ID of each of your devices.

Determining Current SCSI IDs

Manufacturers use many different methods to set SCSI IDs, including jumpers, DIP switches, and push buttons. If your device is brand new, try to find the default SCSI ID in its accompanying manual. Otherwise, check the device itself for the current SCSI ID. Alternatively, locate the information in the manual explaining how SCSI IDs are set for the device you are installing.

To make installation easier, write the SCSI ID on a piece of tape and affix it to the device.

Planning Your SCSI IDs

Your main concern is to make sure that no two devices use the same SCSI ID.

- If you are installing only one SCSI device, make sure you do not assign it SCSI ID #7, which is reserved for the controller.
- If you are installing more than one SCSI device, you can improve system performance by assigning SCSI IDs such that your fastest and most-used devices receive priority over slower devices.

Devices with higher SCSI IDs receive priority from your computer over devices with lower IDs. The controller uses SCSI ID #7, so it is accorded the highest priority by your computer. Be sure to assign higher IDs to your most often used, and fastest, devices.

For example, your main SCSI hard drive should be assigned SCSI ID #6 so that it will receive priority over other SCSI devices.

Note: If you have more than one SCSI hard drive, the drive with the lowest ID will always be the boot drive.

Example: If you have two SCSI hard drives, one with SCSI ID 5 and the other with SCSI ID 6, the system will boot from the drive with SCSI ID 5.

The following table indicates the descending order of priority to be considered when you assign SCSI ID numbers—hard drives should receive highest priority (and highest SCSI IDs), while scanners and other peripherals, such as tape drives or digital cameras, should receive the lowest priority and, consequently, lowest SCSI IDs.

Order of Priority
Hard drives
Rewritable Optical Drives
CD-ROM drives
Scanners and other peripherals

Use the following table to plan your SCSI ID numbers.

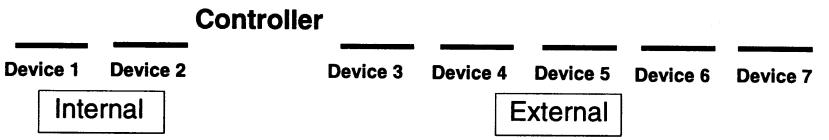
ID	Device
7	TMC-16XX Controller
6	
5	
4	
3	
2	
1	
0	

Changing SCSI IDs

If necessary, change the SCSI IDs of your SCSI devices as described in the documentation provided with each device.

Step 3. Setting Termination

You can connect as many as seven SCSI devices to your controller in a "SCSI chain." Devices in the SCSI chain can be installed internally (inside your computer), externally (outside your computer), or both.



Termination is, basically, the closing of a circuit. The two basic rules of termination are:

- **The first and last devices in the chain must be terminated.**
- **Devices in the middle of the chain cannot be terminated.**

The following table shows where termination is required for various configurations of internal and external SCSI devices. The shading shows devices in each configuration. T's indicate where termination is needed.

Last Internal	First Internal	Controller	First External	Last External
	T	T		
		T	T	
T		T		
		T		T
	T		T	
	T			T
T			T	
T				T

Use the table to determine where you need termination. Then set the necessary termination on your SCSI devices and the controller.

Terminating SCSI Devices

Some SCSI devices have built-in termination controlled by a DIP switch, jumper, or push-button. Other devices use terminators on the cable.

To find out where and how a device is terminated, refer to the documentation provided with the device.

Terminating the Controller

The TMC-16XX controllers supply constant Termination Power at default configuration, which may be disabled via jumper W4.

Step 4. Configuring the Controller

The following table shows default interrupt and memory settings.

Function	Location on the Controller	Default Value	Current Value
Interrupt	W1—IS0 installed IS1, IS2 open	IRQ5	
I/O Address	W1—IOS0 open IOS1 open	0140	
Active Termination	W5 installed	Enabled	
Termination Power	W4 installed	Enabled	
Memory Enable	W2—MEM installed	Enabled	
Memory Address	W1—MS0 installed MS1 open	CA000	

The default values work in most installations.

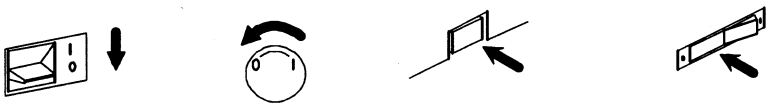
If you know of any conflicts with other equipment installed in your computer, then change the settings on the controller before you install it. Otherwise, go ahead and install the controller.

To change any of these settings, refer to "Appendix B: Setting Controller Options." If you change any options, write the new values in the table on this page.

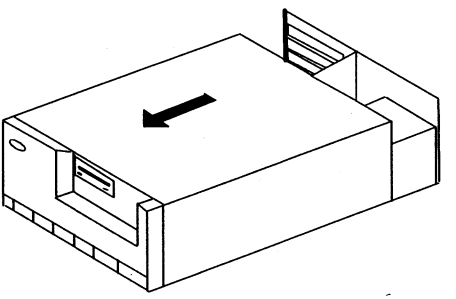
Step 5. Installing the Controller

To install the controller in your computer:

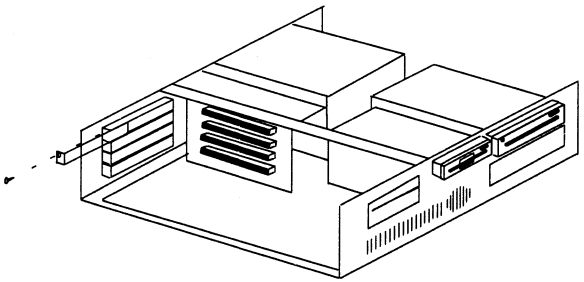
1. Turn off your computer and any devices connected to it (such as monitors and printers). Unplug all power cords.



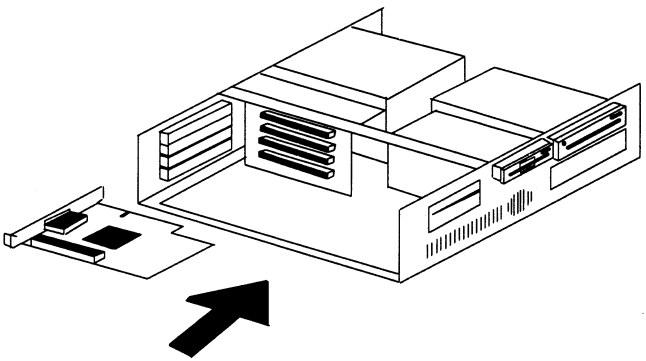
2. Remove your computer's cover.



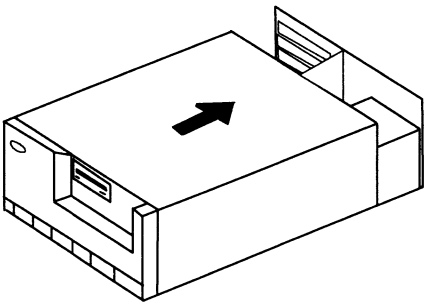
3. Choose an open expansion slot. Remove the expansion slot cover by removing the lock screw and sliding out the cover.



4. Align the controller with the expansion slot and push it into the socket. Replace the lock screw.



5. If you are installing external SCSI devices only, replace your computer's cover. If not, continue to the next step.



Step 6. Installing SCSI Devices

Set up your SCSI devices as described in the documentation provided with each device.

For most internal devices, you need to secure the device inside the computer and connect a power cable.

For external devices, connect the power cables, but do not plug them into an electrical outlet yet.

Step 7. Connecting Cables

Install your controller and SCSI devices before you connect the cables.

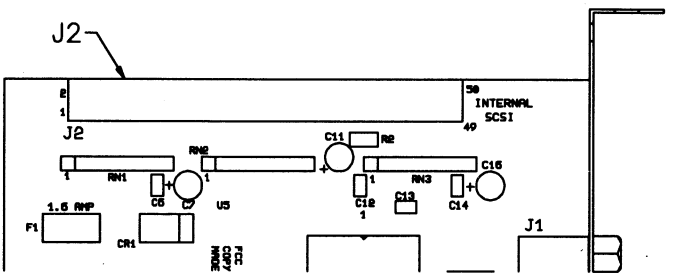
Connecting Internal SCSI Devices

If you are installing external SCSI devices only, proceed to the next section, "Connecting External SCSI Devices."

The typical internal cable has three connectors so you can connect two internal SCSI devices to the controller.

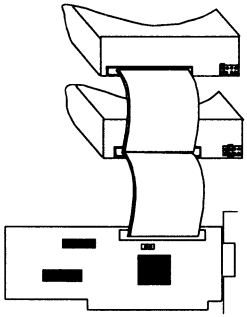
To connect internal devices:

1. Connect one end of the ribbon cable to the controller at connector J2.



2. Connect the cable to your internal SCSI devices after they are installed.

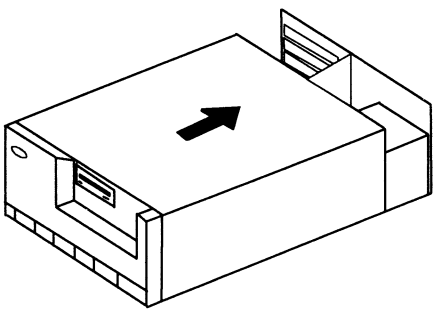
   If you are installing only one internal device, connect it to the middle connector on the cable to minimize cable length. The illustration shows cabling for two internal devices.



3. If you are connecting a CD-ROM drive and wish to use the internal audio output from that drive, please refer to the instructions that came with the drive or contact the drive manufacturer.

   If the drive has an external audio output on the front panel (usually marked as headphone), connect your headphone mini jack to hear audio from your application(s) that support audio.

4. Replace your computer's cover.



Connecting External SCSI Devices

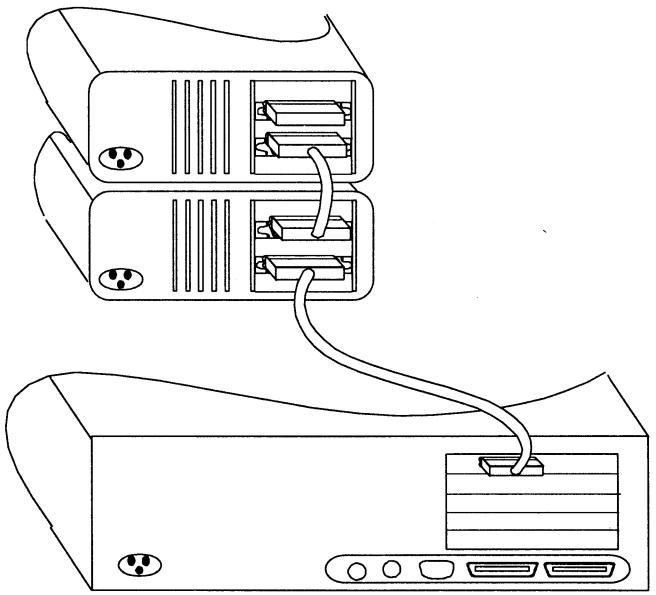
To connect external devices:

1. Connect the 25-pin (TMC-1650/1670) or 50-pin (TMC-1660/1680) end of the cable to the controller.

   The connector is shaped so it fits only one way. If you need to release the cable, squeeze the tabs on both sides of the connector.

2. Connect the cable to your external SCSI device.

   The illustration shows cabling for two external SCSI devices. Note that the last device has a terminator on its top SCSI port.



3. If necessary, connect cables to additional SCSI devices.
4. If you are connecting a CD-ROM drive and wish to use the external audio output from that drive, please refer to the instructions that came with the drive or contact the drive manufacturer.

   If the drive has an external audio output on the front panel (usually marked as headphone), connect your headphone mini jack to hear audio from your application(s) that support audio.

Appendix A: Troubleshooting

If your computer does not start up correctly or SCSI diagnostics do not recognize a device, check these items:

- Are all your SCSI devices plugged in and turned on before you start your computer?

  Some devices need to be turned on before you start the computer.

- Are cables installed correctly?

  Make sure all cables are firmly attached to the correct ports. Sometimes switching the order of devices in the SCSI chain will solve the problem.

- Are SCSI IDs set properly?

  Each device must have a unique SCSI ID from 0 through 6.

- Is termination installed properly?

  The first and last devices in the SCSI chain must be terminated. Devices in the middle of the chain cannot be terminated.

If you cannot access a device, have you installed its device driver? The controller has support built-in for SCSI hard drives. You must install device drivers for devices such as rewritable optical drives, tape or CD-ROM drives.

For service or support, contact your place of purchase.

SCSI BIOS Information

The Future Domain SCSI ROM BIOS is compliant with the IBM PC AT adapter ROM BIOS interface specifications. This BIOS supports the Int 13h mass storage interrupt vector for fixed disks, and the Int 4Fh CAM (Command Access Method) vector for generic SCSI support. The BIOS, which can support up to seven SCSI fixed disks, also supports Int 19h for booting from a SCSI device.

The BIOS always arbitrates from ID 7, so no device should ever be set at target ID 7.

POST Sequence

During POST (Power On Self Test) the SCSI ROM BIOS is called by the system BIOS to initialize. The SCSI ROM BIOS first initializes the controller and the SCSI bus, and then scans the SCSI bus looking for SCSI devices. The BIOS scans SCSI target IDs from 0 to 6. If a disk device is found at ID 4 or ID 5, it will look for more disk devices at logical unit numbers (LUNs) 1 through 4.

Int 13h Fixed Disk Support

If any disk devices are found during the scan, the SCSI BIOS will chain itself to Int 13h. If the first fixed disk in the system is a SCSI disk, then Int 19h is also chained. The SCSI BIOS may support up to seven fixed disk devices.

Int 4Fh CAM Support

If any SCSI device is detected during the scan, the SCSI BIOS will chain itself to the Int 4Fh vector, which is used to provide CAM support for SCSI devices on that adapter. CAM is a generic SCSI interface defined by ANSI (American National Standards Institute).

256-Byte-Per-Sector Support

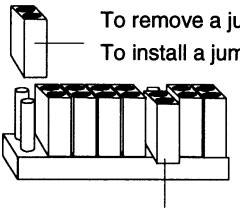
The Future Domain SCSI ROM BIOS supports fixed disk media with either 256 or 512 bytes per sector. If a fixed disk has 256 bytes per sector, the BIOS will convert two sectors to a single sector to make the disk appear to the system to have 512 bytes per sector.

Fast Synchronous Support

The Future Domain SCSI ROM BIOS will negotiate with each target device during the POST SCSI bus scan for Fast Synchronous support. If the device does not support Fast Synchronous support, the BIOS will try Synchronous support. If the device does not support either Fast Synchronous or Synchronous data transfer, then the BIOS will transfer data Asynchronously. When the device information is printed to the screen, the transfer rate will be printed after it. For Fast Synchronous data transfer rate this will be "(FS)," for Synchronous data transfer rate this will be "(S)," and for Asynchronous data transfer, it will be "(A)."

Appendix B: Setting Controller Options

Options are set with jumpers on the controller, as shown in the illustration.

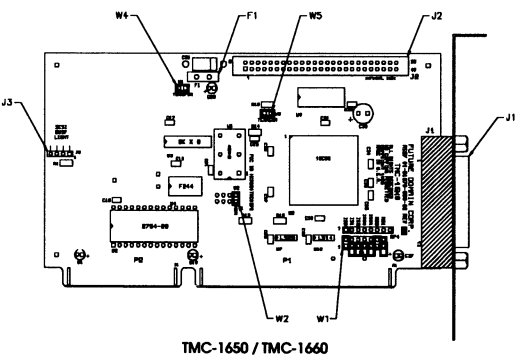


To remove a jumper, pull it straight up off the pins.
To install a jumper, push it straight down over both pins.

To store a jumper, place it on one pin only.

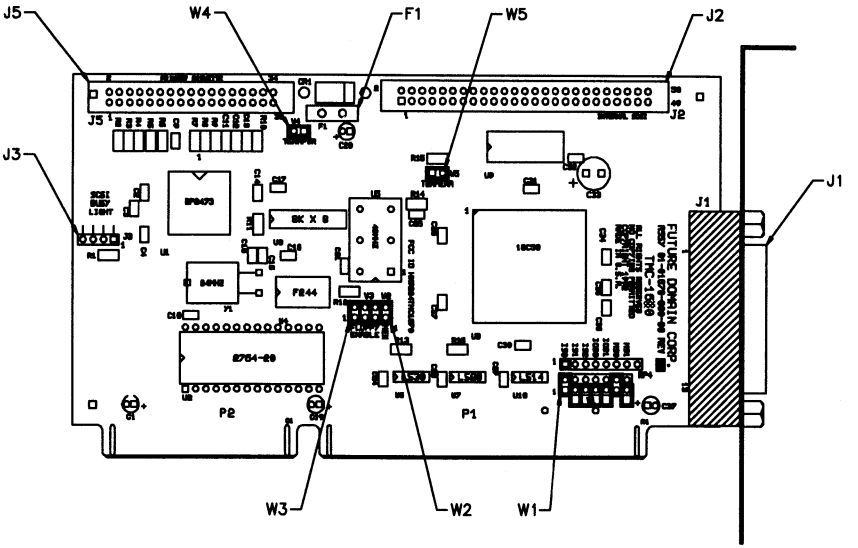
Jumper Locations

The following illustrations show the location of jumpers that set controller options.



TMC-1650 / TMC-1660

OPTION LABELING	FUNCTION
W1-MS0, MS1	Memory Address
W1-IOS0, OS1	I/O Address
W1-IS0, IS1, IS2	Interrupt Level
W2	RAM Enable/Disable
W4	Termination Power
W5	Active Termination Enable
F1	Poly Switch Thermal Fuse



TMC-1670 / TMC1680

OPTION LABELING	FUNCTION
W1-MS0, MS1	Memory Address
W1-IOS0, OS1	I/O Address
W1-IS0, IS1, IS2	Interrupt Level
W2	RAM Enable/Disable
W3	Floppy Enable (3 jumpers)
W4	Termination Power
W5	Active Termination Enable
F1	Poly Switch Thermal Fuse

Interrupt

This setting defines the interrupts used by the controller. The controller's interrupt setting cannot be used by other devices in your computer.

Interrupt jumpers are labeled IS0, IS1, and IS2.

IS0 W1-1	IS1 W1-2	IS2 W1-3	Interrupt Level	Diagram
Open	Open	Open	3	
Closed	Open	Open	5 (Default)	
Open	Closed	Open	10	
Closed	Closed	Open	11	
Open	Open	Closed	12	
Closedd	Open	Closed	14	
Open	Closed	Closed	15	
Closed	Closed	Closed	Disabled	

Memory Address

This setting defines the section of computer memory reserved for exclusive use by the controller (controller's ROM BIOS). It cannot be used by other devices in your computer.

Memory address jumpers are labeled MS0 and MS1.

The default memory address range is 8K from CA00h to CBFFh.

Memory Address Selection			
MS0 W1-6	**MS1 W1-7**	**Memory Address Range**	**Diagram**
Open	Open	C800 - C9FF	
Closed	Open	CA00 - CBFF (Factory Default)	
Open	Closed	CE00 - CFFF	
Closed	Closed	DE00 - DFFF	

If you are using a memory manager, you must exclude the controller's memory address range to avoid memory conflicts. For directions, refer to your memory manager's documentation.

For example, when using the PC-DOS memory manager EMM386, the following line in your CONFIG.SYS file excludes the adapter's default memory address:

```
DEVICE=EMM386.EXE X=CA00-CBFF
```

I/O Address

This setting defines the default address for use by the AT computer's I/O port. If another device is mapped into this address, there are three alternate I/O port addresses that the controller can use.

I/O address jumpers are labeled IOS0 and IOS1.

The default I/O address range is 0140 - 014F.

I/O Address Range			
IOS0 W1-4	**IOS1 W1-5**	**I/O Address Range**	**Diagram**
Open	Open	0140 - 014F (Factory Default)	
Closed	Open	0150 - 015F	
Open	Closed	0160 - 016F	
Closed	Closed	0170 - 017F	

Floppy Controller (TMC-1670/1680 Only)

This setting defines whether the floppy controller is enabled. Floppy controller jumpers are labeled W3-1, W3-2, and W3-3. The default setting is to have these jumpers enabled. To disable the floppy controller, remove all these jumpers.

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warranty inside back cover

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